tensity of light during the next period of absence of moonlight is slightly less, but we continue an ephemeris from the elliptic elements calculated by M. Fabritius:—

*At Greenwich Midnight*

| | R.A. h. m. s. | N.P.D. ° ′ | Log. distance from Earth. | Sun. |
|---|---|---|---|---|
| Oct. 27 | 7 31 37 | 103 58·6 | 0·7637 | 0·7767 |
| 28 | – 31 22 | 104 3·9 | | |
| 29 | – 31 6 | — 9·1 | 0·7630 | 0·7782 |
| 30 | – 30 50 | — 14·3 | | |
| 31 | – 30 32 | — 19·5 | 0·7624 | 0·7796 |
| Nov. 1 | – 30 14 | — 24·6 | | |
| 2 | – 29 55 | — 29·7 | 0·7618 | 0·7810 |
| 3 | – 29 36 | — 34·7 | | |
| 4 | – 29 16 | — 39·7 | 0·7612 | 0·7824 |
| 5 | – 28 55 | — 44·6 | | |
| 6 | – 28 34 | — 49·5 | 0·7606 | 0·7838 |
| 7 | – 28 12 | — 54·3 | | |
| 8 | 7 27 48 | 104 59·0 | 0·7600 | 0·7851 |

THE VARIABLE STAR U CEPHEI.—A minimum of this variable was observed by Mr. Knott at Cuckfield, on the evening of October 20. The time was 8h. 34m. G.M.T., and the star's magnitude was 9·2. The minimum fell an hour later than Schmidt's elements (*A. N.* 2382) would predict. The divergence of Mr. Knott's observations has increased to that amount from nine minutes in 1881; at the same time he doubts if a slight increase of the adopted period would of itself completely satisfy the observations, and perhaps the period may be subject to variation.

Reckoning from the minimum on October 20, and using Schmidt's mean period, the next few minima will fall thus:—

| | | |
|---|---|---|
| October 30, 7h. 52m. G.M.T. | ... | November 9, 7h. 11m. |
| November 4, 7h. 31m. G.M.T. | ... | November 14, 6h. 50m. |

## PHYSICAL NOTES

AT the British Association meeting a paper by Prof. J. A. Ewing was read, on the magnetic susceptibility and retentiveness of iron and steel. This paper was a preliminary notice of some results of an extended investigation which the author had been conducting for three years in Japan. Experiments with annealed rods and rings of soft iron wire showed that that material possesses the property of retentiveness in a very high degree. As much as 90 and even 93 per cent. of the induced magnetism survived the removal of the magnetising force. The extraordinary spectacle was presented of pieces of soft iron entirely free from magnetic influence nevertheless holding an amount of magnetism (per unit of volume) greatly exceeding what is ever held by permanent magnets of the best tempered steel. The magnetic character of the iron in this condition was, however, highly unstable. The application of a reverse magnetising force quickly caused demagnetisation, and the slightest mechanical disturbance had a similar effect. Gentle tapping removed the residual magnetism completely. Variations of temperature reduced it greatly, and so did any application of stress. On the other hand, the magnetism disappeared only very slowly, if at all, with the mere lapse of time. The residual magnetism in hardened iron and steel was much less than in soft annealed iron. The maximum ratio of intensity of magnetism to magnetising force during the magnetisation of soft iron was generally 200 or 300, and could be raised to the enormous figure of 1590 by tapping the iron while the magnetising force was being gradually applied. A number of absolute measurements were made of the energy expended in carrying iron and steel through cyclic changes of magnetisation; and the effects of stress on magnetic susceptibility and on existing magnetism were examined at great length. The whole subject was much complicated by the presence of the action which, in previous papers, the writer had named *Hysteresis*, the study of which, in reference both to magnetism and to thermoelectric quality, had formed a large part of his work.

M. P. TIHON has lately shown at the Industrial Science Society of Lyons a new semi-incandescent lamp, giving the brilliancy of an arc light. This is attained by having two carbon rods, slightly inclined to one another, brought down on to a small prism of chalk, and separated from one another by a small rod of the same material. The current passes through the chalk rod making it incandescent. By this means the light is rendered steadier than an arc light, and it is said to have the same brilliancy.

MR. FRANK GERALDY has published some interesting statistics comparing the cost of the electric light with gas, both as to its actual cost and its cost per candle power:—

| Installation. | Electric light system. | No. of lamps. | Candle power of lamps. | Motor. | Total cost per hour gas. | Total cost per hour electric light. | Cost per candle power gas. | Cost per candle power electric light. |
|---|---|---|---|---|---|---|---|---|
| Salle de Télégraphistes at Brussels (Nord) ... ... | Jaspar | 3 | 235 | Gas | 1·86 | 3·82 | 0·0265 | 0·0054 |
| Halle aux marchandises, Lyons Station (Paris) ... | Lontin | 18 | 64 | Steam | 6·825 | 6·625 | 0·0273 | 0·0054 |
| Spinnery at Riverside (United States) ... ... ... | Brush | 71 | 75 | ,, | 36·80 | 11·68 | 0·0353 | 0·0022 |
| Ducommun Establishment at Mulhouse ... ... ... | Serrin | 4 | 110 | ,, | — | 6·64 | 0·044 | 0·015 |
| Passage in the Friedrich-strasse (Berlin)... ... ... | Siemens | 10 | 50 | Gas | 9·14 | 6·45 | 0·040 | 0·013 |
| Thames Embankment... ... | Jablochkoff | 20 | 28 | Steam | — | 0·487 | 0·0150 | 0·018 |
| Spinnery of E. Manchon (Rouen) ... ... ... | Sautter-Lemonnier | 6 | 150 | ,, | 9·550 | 7·387 | 0·0597 | 0·0082 |

This is only an extract from a longer list, but conclusively shows that in large instalments electric lighting is cheaper than gas on the total cost; whilst considered per candle power it is far away cheaper. An exception to the rule seems to occur in the first on the list; this is due to the smallness of the installation. In the case of the Thames Embankment the light is reduced by the use of ground glass globes. If we bear in mind the fact that the economy consists in having large installations, we shall be brought face to face with the fact that whereas gas is now made in as large quantities as is practicable, electricity has still to be brought to that state of economy. Thus we may still expect a greater economical advantage than is shown by the above figures.

M. J. JAMIN has a paper in the *Journal de Physique* on the "Critical Point of Liquefiable Gases," in which he discusses a new theory. He says: "I believe that gases are liquefiable a all temperatures when the pressure is sufficient." Describing Cagniard-Latour's experiment, he says: "According to known laws, the quantity of vapour above the liquid increases very rapidly, its density increasing at the same rate as its weight without known limit. Again, the remaining portion of the liquid expands at an increasing rate until it passes that of the gas (Thilorier); it is clear then, by the effect of these inverse variations, that at last a limiting temperature must be reached when the liquid and the vapour must have the same weight for the same volume. At this point they are inseparable; the vapour

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does not rise nor the liquid fall, and the surface of the liquid disappears." Thus the critical point is the temperature when a liquid and its saturated vapour have the same density. From the experiments of Cagniard-Latour he deduces that at the critical point a liquid has no latent heat, and in summing up he says: "At the critical point there is no difference between a liquid and its vapour, neither in tension, nor density, nor thermal constitution, nor appearance, nor any property by which they can be distinguished."

PROF. H. S. CARHART, of Evanston, Ill., has made some researches on the effect on the magnetic field of the rotation of a pierced iron disk in front of the poles of a magnet. The result of this research is that he has found that an iron screen with a hole in it held in front of the pole of a magnet acts magnetically, as a screen with a hole in it held near a light acts optically, the shape of the hole being clearly defined; thus showing the difference of intensity of the field when the iron is there and when it is removed. He has made use of this property by placing a small coil capable of inductive action opposite each pole of a horseshoe magnet; in between the coils and the magnet he rotated a disk of iron with two concentric circles of holes a quarter of an inch in diameter, which came exactly opposite the two poles of the magnet. The inner circle contained thirty-two holes, and the outer contained sixty-four. The two induction bobbins he had connected up with a telephone. When the disk was rotated, he distinctly heard two musical notes produced which were an octave apart. The name given to this instrument is the magnetophone.

MR. E. VAN DER VEN has been making some researches on the use of phosphor bronze and silicon bronze wires for lines, the practical results of which are: that their resistances compared with copper of the same diameter are, phosphor bronze, 30 per cent.; silicon bronze, 70 per cent.; steel being 10·5 per cent. The stretch that can be given from pole to pole is, for steel, 2 mm. diameter, 130 feet; phosphor bronze or silicon bronze, 1 mm. diameter, 106 and 91 feet respectively. Another great point is that a bronze wire, on account of its elasticity, would coil up before it had fallen far if broken, thus preventing accidents from broken wires.

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## THE GREAT TIDAL WAVE

WE have received several communications on extraordinary tidal phenomena, which seem to be connected with the great earthquake disturbance in Java in August last. We bring these communications together here:—

I have received an interesting letter from Major A. W. Baird, R.E., who directs the Tidal Department of the Survey of India, on the results of the earthquake in Java. The extract from the letter, which I append, speaks for itself. It may be worth mentioning, however, that Negapatam in the Carnatic and Port Blair in the Andaman Islands are nearly in the same latitude and on opposite sides of the Bay of Bengal. It is to be hoped that Major Baird will communicate the results of his investigation to some scientific society in this country.

Trin. Coll., Camb., October 18 G. H. DARWIN

### INDIA

*Extract from a Letter from A. W. Baird to G. H. Darwin, dated Poona, September 27, 1883*

"The wave caused by the volcanic eruption at Java is distinctly traceable on all the tidal diagrams hitherto received, and I am informed of great tidal disturbance at Aden on August 27; but the daily reports are always meagre in information. Kurrachee and Bombay also show the disturbance, and as far as I have examined the wave reached half way up to Calcutta on the Hooghly.

"Negapatam was most disturbed, and at Port Blair there was very great disturbance. I have reports from Port Blair of tremendous noises as if a ship was firing guns as signals of distress, and they sent out a steamer to look about. Similar reports come from the Nicobars, and I see by the papers the noises were heard at Tavoy and Mergui in Burmah.

"I am collating the information and getting up diagrams showing the tide-curves of August 27 and 28, all in Port Blair time, and all on the scale $\frac{1}{12}$. I am of opinion that I can distinctly prove the first wave to be negative, and that it certainly extended to Negapatam, thus showing that there must have been at first an enormous depression or subsidence at the bottom of the sea in the Straits of Sunda.

"By proper handling of the records I hope to deduce the velocity of the wave from Java to Aden, and from Java up the Bay of Bengal. . . . .

"Unfortunately it will take a long time to get the information about the time the wave was generated; but I am leaving no stone unturned to get it. I have sent about twenty circulars to various port officers, and I have asked —— to ask for information from Batavia."

### SOUTH AFRICA

Some tidal stations have recently been established, on my recommendation, along the coast of South Africa, and the results obtained from the observations will be ultimately discussed. Meanwhile I inclose herewith a tracing from the tidal diagram at one of these stations (taken at Port Elizabeth under Mr. Shield, harbour engineer), covering the period from noon on August 26 to noon on August 30. It will be seen from the diagram that till 4 p.m. on August 27 the curve was perfectly normal.

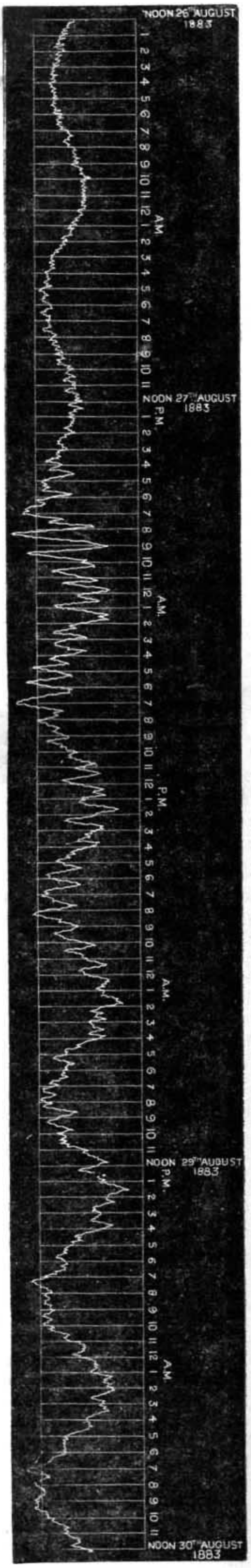
At 8 p.m. on August 27 an extraordinary oscillation, having a period of about an hour, commenced, and at 9 p.m. had attained a range of five feet. It then gradually but very slowly subsides.

Mr. Shield thinks, and I agree with him, that the tidal disturbance in question has its origin probably in the recent disturbance in the Straits of Sunda. Our information here is as yet very defective. Accurate data as to that disturbance would be of the greatest interest. DAVID GILL

Royal Observatory, Cape of Good Hope, Sept. 25

### MAURITIUS

In the Mauritius *Mercantile Record* of September 8, Mr. C. Meldrum gives a collection of data on the phenomena observed in the neighbourhood of Mauritius. One of the local papers, the *Progrès Colonial*, gave, in its issue of August 29, an account of a curious phenomenon observed in the harbour of Port Louis, by Capt. Ferrat, of the s.s. *Touareg*. The *Touareg* was moored in the Trou Fanfaron, near the Patent Slip. Towards 2 p.m. on August 27 Capt. Ferrat, who was then on board of his vessel, observed that in that part of the harbour the sea



The Tidal Wave, South Africa.

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